SECTORAL INFORMALITY IN TURKEY

A Master's Thesis

by
YASİN DALGIÇ

Department of
Economics
Bilkent University
Ankara
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To my family

SECTORAL INFORMALITY IN TURKEY

The Institute of Economics and Social Sciences
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by

YASİN DALGIÇ

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I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

Asst. Prof. Selin Sayek Böke
Supervisor

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

Asst. Prof. Ümit Özlale
Examining Committee Member

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

Asst. Prof. D. Şirin Saraçoğlu
Examining Committee Member

Approval of the Institute of Economics and Social Sciences

Prof. Erdal Erel
Director

ABSTRACT

SECTORAL INFORMALITY IN TURKEY

DALGIÇ, Yasin

M.A., Department of Economics

Supervisor: Asst. Prof. Selin SAYEK BÖKE

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This thesis evaluates the sectoral based probability of informal employment and its possible determinants. By decomposing the effects of workers' characteristics and sectoral features on probability of informal employment, new measures of informality degrees of sectors are calculated. These new informality measures provide an easy and understandable interpretation and comparison across sectors. These new measures suggest that people who work in agriculture (includes agriculture, forestry and fishing) and construction sectors are more likely to be employed informally, while financial (financial intermediation, real estate, renting and business activities) and mining (mining and quarrying) sectors are relatively more formal in terms of employment. Additionally, among the determinants of differences in the probability of informal employment, the share of male workers and the amount of sectoral credits over GDP are found to be significant.

Keywords: Informality, Social Security, Informality Differentials, Linear Probability Model, Feasible Generalized Least Square Method.

ÖZET

TÜRKİYE'DE SEKTÖREL KAYITDIŞILIK

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Bu tez, Türkiye'deki sektörel bazda kayıtdışı istihdam olasılığını ve bunun olası nedenlerini incelemektedir. İşçi karakteristiklerinin ve sektörel özelliklerin ayrıştırılmasından sonra sektörlerin yeni kayıtdışılık düzeyleri hesaplanmıştır. Bu yeni kayıtdışılık ölçüleri, sektörler arasında kolay ve anlaşılabilir yorumlar yapılmasına imkân vermektedir. Bu yeni ölçülere bakıldığında, tarım (tarım, ormancılık ve balıkçılık) ve inşaat sektörlerinde çalışan insanların kayıtdışı çalıştırılmaya daha yatkın oldukları bulunmuştur. Ayrıca, finansal (finansal aracılık, ev sahipliği, kiralama ve ticari faaliyetler) sektör ve madenciliğin (madencilik ve taşocakçılığı) kayıtdışı istihdam açısından göreceli olarak daha formal olduğu göze çarpmaktadır. Ek olarak, sektörlerde kayıtdışı istihdam olasılığı farklılıklarının nedenleri arasında sektörel banka kredilerinin Gayri Safi Milli Hâsıla'ya oranının ve sektörlerde çalışan erkek işçi oranının önemli olduğu bulunmuştur.

Anahtar Kelimeler: Kayıtdışılık, Sosyal Güvenlik, Kayıtdışılık Farklılıkları, Lineer Olasılık Modeli, Uygulanabilir Genelleştirilmiş En Küçük Kareler Metodu.

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CHAPTER I

INTRODUCTION

The term informality means different things to different people, but almost always with negative connotations: unprotected workers, excessive regulation, low efficiency and unfair competition, evasion of rule of law, underpayment or nonpayment of taxes and work underground or in the shadows[1]. Having no common description has given rise to usage of many terms in informality definition by scholars.

Feige (1990) defines informality as follows: "…when economic agent's actions fail to adhere to the established rules or are denied their protection, the agent is regarded as a member of the informal sector of the economy". Assaad (1987) and Portes (1994) state that the important characteristic of informality is the noncompliance with legal and administrative regulations rather than the social regulations. Maloney (2004) characterizes the informal sector as consisting of "small-scale, semi-legal, often low-productivity, and frequently family-based, perhaps pre-capitalistic enterprises".

Schneider and Enste (2000) use the term "shadow economy" instead of informality and they broaden the definition as all market based legal production of

[1] See the report Informality, Exit and Exclusion by Perry et al. (2007) which was published by the World Bank. The report concentrates on the countries in Latin America and Caribbean.

goods and services that are deliberately concealed from public authorities to avoid payment of income or value added taxes, to avoid payment of social security contributions, to avoid having to meet certain legal market standards, such as minimum wages, maximum working hours, safety standards, etc. and to avoid complying with certain administrative procedures such as completing statistical questionnaires or other administrative forms.

The International Labor Organization (1993) describes the informal sector consisting of economic units "with low level of organization with little or no division of labor and capital as factors of production on a small scale and mostly based on personal and social relations rather than contractual arrangements"[2]. In our study we will focus on the "noncompliance with the legal and administrative regulations" view of informality and use social security non-registration of workers as a measure which complies with the definitions that Asaad (1997) and Portes (1994) use.

Since informal activities are seen as a drag on productivity and growth of the economy and may lead to erosion of the functioning and the legitimacy of market and equity enhancing institutions, evaluation and measurement is important for policy implications and in turn for the well-being of the economy. Moreover, the social part of the incidence is also a central issue since jobs in the informal sector lack a sheltering mechanism to families from adverse shocks, loss of jobs, illness or calamity[3].

[2] This definition belongs to the International Labor Organization (ILO) Resolutions Concerning Statistics of Employment in the Informal Sector Adopted by the 15th International Conference of Labor Statisticians in January 1993.
[3] See Perry et al. (2007).

This thesis is organized as follows: Chapter 2 provides information about methods for estimating informality. In Chapter 3, the thesis will present the literature review about informality. Chapter 4 gives explanation about the data with some preliminary evidence about informality in Turkey. Moreover, I will also present the regression results related with workers' characteristics and sector of employment in the probability of informal employment, and the methodology which is used for creating a new comparable measure related with the probability of sectors to employ people informally and compare the sectors using this new measure of informality. Additionally, Chapter 4 presents the possible explanations of the differences of sectors in terms of informal employment applying regression analysis using the new measures of informality of the sectors. Finally, in Chapter 5, I will present concluding remarks.

CHAPTER II

METHODS FOR ESTIMATING INFORMALITY

Despite the fact that measurement of the extent of informality is a very crucial indicator for the well being of the economy, due to heterogeneity in terms of its definition and lack of data, there is no certain answer on how to do so. Moreover, since most economic activities that are classified as informal are not captured by national accounts and official statistics, the disputes on exact measurements of informality are likely to persist in the literature in the near future.

Although the difficulty of measurement is obvious, there are several methods that have been enhanced in order to gauge the size of the informal economy. Garcia-Verdu (2007) classifies these methods into three: direct methods, indirect methods (indicator approaches) and the model approach[4]:

Direct approaches to measure informality use voluntary surveys or data from tax audits to construct estimates of total economic activity and its measured and unmeasured components.

[4] This categorization and explanation of the methods are heavily based on the report of Informality, Exit and Exclusion by Perry et al. (2007).

These surveys usually ask respondents to pronounce their labor status, social security conditions or the degree of tax compliance in their industry. On the other hand, tax audit based approaches calculates the size of the informal economy using the difference between the income-stated tax returns and the exact level of income, which is usually found after an audit. The major problem with voluntary surveys is the degree of credibility of the answers. Furthermore, tax-audit-based methods are applicable only to a few countries due to lack of data[5].

Indirect methods, which are based on macroeconomic indicators, are associated with the difference between the actual value of the macroeconomic variable and its account value. For example, one of these methods measures the difference between the GDP through income and expenditure sides, where the discrepancy is attributed to the informal economy. The main problem with the GDP method is that it may not give precise results in the economies with high saving rates and transfer payments to abroad. Another method in indirect measurement of informality is the electricity consumption approach. Kauffman and Kaliberda (1996) propose that the difference between the growth rates of GDP and electricity consumption can be attributed to the growth of the informal economy. Although this approach has been used by many authors[6], it has some shortcomings. For example, it does not account for the technological improvement in machinery and in order to compute the difference one needs to have a base year where informal economy is insignificant. The third method is the currency demand approach where the main purpose is to detect the discrepancy between the estimated values of the specified money demand equation and the observed values

[5] Schnedier (2005) uses tax audit based approach for US and Sweden.
[6] See Ghosh and Saumik (2007) and Ihrig and Moe (2004), among others.

from actual data[7]. But this method has also been criticized due to assumptions such as a common velocity of money circulation between official and unofficial economies, only cash transactions in the unofficial part of the economy or a base year where the extent of the unofficial economy is zero[8].

The third and last group includes the Multiple Indicator - Multiple Cause (MIMIC)[9] models. In MIMIC models the main idea is that there is a system of equations where one group of equations includes the effects (or indicators) as a function of the latent variable (informal economy in our case) and the other group models the informal economy as a function of the causal variables. Applying maximum likelihood estimation to the reduced form of the system of equations which are constructed from the indicator variables and causal variables, the size of the informal economy is estimated. The model is a popular one among the others since it enables one to incorporate several different causal factors that influence underground activity and to determine their relative significance. Moreover, it allows one to take into account several different "signals" of underground economic activity simultaneously[10]. However, this approach is also subject to many criticisms; for example Smith (2002) and Hill (2002) state that the model should have relevant causal and indicator variables but there are no common economic theories to classify them. Moreover, Breusch (2005) shows that time path estimation of the informal economy for Canada during the period 1976-1994 using this method leads to wrong results; the results mostly reflects price inflation and real growth rate of the related country rather than the size of the informal economy.

[7] See Schneider (1986).
[8] See Thomas (1999) and Schneider (1986) for criticisms of the method.
[9] A simple explanation of the theoretical model is available at Breush (2005) and Macias (2008).
[10] See Tedds and Giles (2000).

In this study, we will use the direct approach method by utilizing the social security registration information of the respondents in the Labor Force Household Survey Yearly Dataset for the period 2000-2008 for Turkey. The information regarding the social security registration status of the individuals provides us accurate information as a measure of informality which makes our measurement relatively straightforward and more precise compared to the indirect methods and MIMIC model. We have the advantage of the truthfulness of the respondents; since the survey has a legal side and people might be subject to sanctions in case of false information. Besides, workers do not have obvious incentives to report that they are formal when they are informal as opposed to firms' incentives to answer similar questions (since hefty penalties can be imposed on firms)[11]. So, this analysis overcomes the criticisms regarding surveys in general, where the respondents might not reveal the truth in their responses. As the survey is carried out by the legal authorities and there is a punishment for false information, these concerns are much less regarding this specific survey. Moreover, we have weights of the individuals for each year to have projections of the population which allows us to make more reliable inferences related with the whole population, not only for the sample size.

[11] See Catao, Pages and Rosales (2009). They also state that using social security registration data for the measure of informality is highly correlated with other economy-wide the measures of informality.

CHAPTER III

LITERATURE REVIEW

Besides the measurement attempt, there is also a very large literature concentrating on the determinants of the informal economy. Below I will provide an overview of the literature, with a focus on the studies on informality in Turkey.

3.1. Determinants of Informality

3.1.1. Explicit and Implicit Taxes

While demand for greater flexibility, autonomy and entrepreneurship motives, risk taking, family tradition and mobility opportunities can be counted as voluntarily decisions for choosing informal sector, Blau (1987) and Maloney (1999) state that being short of human capital particular to a work or a firm may force people to prefer informal works. Loayza (1997), Azuma and Grossman (2002) and Dabla Norris et al. (2008) suggest that since formality imposes fiscal burdens on a firm such as taxes or costs of complying with regulatory requirements (for example social security contributions), firms try to operate informally by taking the risk of penalties.

In their empirical work, Friedman et al. (2000) evaluate 69 countries[12] from very different regions and find that higher tax rates are associated with less informal activity as a percent of GDP[13]. They also evaluate corruption and they find that it is associated with more informal activity in view of the fact that entrepreneurs try to avoid formal work to reduce the cost of official procedure. On the other hand, Schneider and Enste (2000) estimate the size of the shadow economy for 76 developing, transition and OECD countries and find that informal activity is strongly related to increasing burdens of taxation, social security contributions and the corruption level in the economy.

Ihrig and Moe (2000) also investigate how tax policy affects the size of informal sector and tries to quantify the cost of it using a dynamic model. Sarte (2001) analyzes the link between the rent-seeking bureaucracies and the size of the informal economy in a theoretical perspective and concludes that because of the rent seeking bureaucrats, firms try to go informal. In their 75 country cross country panel data regression analysis, Loayza et al. (2005) finds that a heavier regulatory burden, particularly in product and labor markets induces informality.

3.1.2. Financial Development

Dabla-Norris et al. (2008) investigates the effect of financial market development and the quality of regulatory burden on informality as well for more than 4000 firms in 41 countries and discover that both of these aspects also do play a role in driving informality. Straub (2005) evaluates the credit market channel of the informal economy in a theoretical manner. Building a model of

[12] See related paper for the list of countries.
[13] This result can be contradictory to what one expects but the authors express that the main reason can be that at least for this set of countries, higher tax rates may generate revenue that provides productivity enhancing public goods and a strong legal environment.

firms' choice between formality and informality, he finds that complying with costly registration procedures allows the firms to benefit from key public goods, enforcement of property rights and contracts that finally result in the participation in the formal credit market. Moreover, Koeda and Dabla-Norris (2008) affirm this fact and find evidence that informality is robustly and significantly associated with lower access to and use of bank credit for firms in 26 transition countries in Eastern Europe and Central Asia.

In a recent work, using the National Household Survey Data for the period 2002-2007 and social registration condition of workers and formal employment contracts data of workers as measures of informality, Catao, Pages and Rosales (2009) also find that financial deepening increases the formalization rate in Brazil. They suggest that since formal credit saves on higher costs and legal insecurity of informal credit markets, firms' incentives to become formal to get cheaper credit from banks increases.

3.1.3. Trade liberalization

The trade aspect of informality is also investigated by many researchers. Among them, Currie and Harrison (1997), where they used micro-level data on individual enterprises, examine the trade reform in Morocco during the 1980s and find that comprehensive trade liberalization led to a rise in firms' hiring of more temporary workers (who are mostly informal). Additionally Pavcnik and Goldberg (2003) study the relationship between trade reforms in Brazil and Colombia and the size of the informal sector. They test the hypothesis that increased foreign competition in developing countries leads to an expansion of the informal sector. They find that there is weak evidence, only for Colombia, and for the period

preceding a major labor market reform that increased the flexibility of the Colombian labor market. Another study by Aleman-Castilla (2006) evaluates the relationship between import tariff reduction under NAFTA and informality for the period 1988-2002 for Mexico. Using social security coverage data as an indicator of informality, they find that by inducing the most productive formal firms to engage in trade, trade liberalization could reduce the incidence of informality through the increase for the labor demand from the less efficient informal firms to more efficient formal ones, increasing the employment share of the formal sector[14].

3.2. Informality in Turkey

Studies on informality in Turkey have increased since the early 1990s. Many of these studies have focused on estimating its size. Among those, Yılmaz and Öğünç (2000), Çetintaş and Vergil (2003), Yurdakul (2006) and Akalın and Kesikoğlu (2007) use monetary approaches to estimate the informal economy in Turkey. Temel et al. (1994) estimate the size using the indirect methods while Savaşan (2003) and Schneider and Savaşan (2007) use Multiple Indicator - Multiple Cause (MIMIC) model. Us (2005) evaluates informality in Turkey by using the Tax Auditing Approach (Direct Method), the Employment Approach, the GNP Approach and the Monetarist Approach (Indirect Methods) and compare the results; concluding that it is very difficult to focus on only one method since calculated sizes differ across methods of measurement.

[14] This is a contradictory result compared to study of Pavcnik and Goldberg (2003), and author ties to the fact that liberalization of trade in Brazil and Colombia has been rather different from the 1990s Mexican experience (See the related paper).

Tansel (1999) evaluates the choice of informality among the wage earners in terms of being covered by a social security program or not and expresses that both for men and women, people with more education are more likely to have social security coverage. Additionally, she also states that people who live in urban areas are more likely to have social security coverage compared to people in rural areas. Bulutay and Taştı (2004) analyze the informality trend in Turkey with respect to different definitions[15] using two different datasets; Household Labor Force Surveys (1990-1999) and Urban Areas Small and Unincorporated Enterprise Survey for the year 2000 and they find that younger people and less educated individuals work tend to more informally[16].

Saraçoglu (2008) studies informal sector in a dynamic model and finds that informality can successfully be reduced by reducing taxes on employment in the formal sector. Another study by Schneider and Savaşan (2006) address the sectoral and micro aspects of informality using data from the textile sector in Turkey. Using a questionnaire related with the informal hiring in the textile sector in 2005, they find that high competition, the skill structure of the employees and the size of the firms are important factors of the textile firms hiring informally.

The main findings of the studies for other countries and Turkey generally comply with each other. For example, Pavcnik and Goldberg (2003) also confirms Bulutay and Taştı (2004) by finding that more educated people and elder individuals tend to work more formally compared to less educated people and single individuals for Brazil. In fact this is not a very surprising result since one can expect that education and skill provides more work opportunities to people

[15] See the related paper for various definitions.

[16] In their study, Bulutay and Taştı (2004) also analyze the sectoral composition (industry, trade and service) of formal and informal people. But this analysis is only based on the number, share and gender of the formal and informal workers and remains very descriptive and limited to three very broad sector classifications.

compared to less educated or less skilled people. Moreover, one can also expect that younger people also tend to work more informally since the elder people consider health care opportunities for their family members compared to younger people.

The positive effect of reducing the tax on employment for the formal employment tend to be a general pronouncement for the studies Loayza (1997), Azuma and Grossman (2002) and Dabla Norris et al. (2008) and Schneider and Enste (2002) with Saraçoğlu (2008) which makes us to consider heavy tax burden as a general problem for the firms, which forces them to operate informally.

There are also several administrative reports regarding informality in Turkey. For example, The 8th Five Year Development Plan has a special report providing comprehensive information about the causes, consequences, methods for determining its size, including many of its perspectives like national income, employment, tax and illegal activities[17].

In another report, Özlale (2008) presents valuable information about the size, institutional and macroeconomic determinants of informality and sector-based opinions of firms regarding informality. He emphasizes that there is an increasing trend in informality in the crisis years (1994 and 2001); and the weak regulations in tax policies, the cost of employing and social security contributions of the formal workers seem to be the primary problems for the firms and construct basis of informality in Turkey.

In this thesis, we will analyze informality not only at the national level but also at the sectoral level and examine its determinants by following the

[17] Report available at http://www.dpt.gov.tr/DocObjects/Download/3455/oik614.pdf

methodology of Pavcnik and Goldberg (2003)[18]. In doing so, we will also be able to discuss the personal characteristics that lead to informal employment of an individual. While there are ample studies on informality in Turkey, there is no study that looks into informality at the sector level for a wide range of sector definitions (Bulutay et al. (2004) study only 3 sectors and Schneider and Savaşan (2006) only look into the textile sector). It is of interest to further understand the dynamics and determinants of informality in Turkey, across sectors and across time (2000-2008).

Using the Household Labor Force Survey Data for the years 2000-2008, we will provide current dynamics of informality in Turkey, both at the individual and sectoral level. This is the first study that combines these two aspects for Turkey and allows a synchronous discussion of the factors that play a role in an individual's informal employment and those that influence the extent of informality at the sectoral level. From the individual worker's point of view, I will investigate the role of worker's characteristics like age, age-squared, sex, marital status, education level and living in urban and rural areas on an individual's working informally. Upon decomposing worker's characteristics and sectoral informality, we will create a new measure of relative informality levels of each sector and a hypothetical sector that represents "the average of all sectors" which is the main aim of this thesis. This will allow identification of whether there are sectors which are ridden by "chronic informality"[19]. Then using these sectoral informality measures, I will also try to determine the underlying reasons of the high levels of informality in these sectors using several variables that have

[18] This methodology allows us to decompose personal and sectoral characteristics of informality. Moreover, we will also be able to evaluate the determinants of the sectoral informality levels.

[19] This definition belongs to the author. By "chronic informality" author means the sectors that have persistent high levels (above the "average") of informality levels for a long period (nine years in our data set) stemming from the reasons apart from workers' characteristics.

possible explanations in the differences probability of informal employment across sectors. Evaluating all these may guide implementation of effective policies on a sectoral basis to policymakers.

CHAPTER IV

DATA AND METHODOLOGY

In this study, the Turkish Household Labor Force Survey (HLFS) annual data will be used[20]. It covers the period 2000-2008 and it is a cross sectional data[21]. The survey is prepared on a monthly basis and the results are published every month. But when the data set is prepared for a specific month, for instance February, three monthly data sets are combined (January and March are also added) by taking the weights of each month into consideration. The survey is prepared as follows: surveyors go to the same families four times in eighteen months. For example, a family, which is visited on January 2000 for the first time, will be visited after three months (in April). The third visit will be after nine months (in January 2001) and the fourth visit will be in (April 2001). If the visit on January is the second visit to that family, then the third visit will follow after nine months. This means, the same people are counted twice in the same year's data set. Since we do not have the data of each individual specifically, we use data

[20] Quarterly data is not publicly available.

[21] Although the data sets for 2000-2003 and 2004-2008 are different in number of questions and their categories, observations and regions, I standardize the categories of the variables that are used in the regressions. Moreover, the data set we use is weighted by taking base year as 2000.

set as cross-section on yearly basis (same people are counted as if they are different)[22].

The surveyors ask a set of questions to all members of the families regarding their socioeconomic characteristics. The surveys contain useful information about a person's age, marital status, gender, level of education, employment activities, whether he/she has a social security registration, his/her sector of employment and several other variables.

This study does not take people into account who are under the age of 15 due to the labor force definition of the Turkish Statistical Institute (TURKSTAT). Our informality measure is based on the question of "Are you registered in Social Security?"[23]. People who are registered are denoted as 0, and those who are not are denoted as 1. We will regress this informality measure on socioeconomic factors like gender, level of education, age, marital status and dummy variables capturing seven main sectors we have in the data set[24] using the linear probability model (LPM), linear probability model with weighted least squares and the Probit model, respectively. Upon obtaining the coefficients of the regressors, we will apply a two stage restricted method which is presented by Haisken-DeNew and Schmidt (1994) and used by Pavcnik and Goldberg (2003) in order to find the main informality measure that we focus on.

The Linear Probability Model (LPM) method is used while regressing the probability of an individual being formally employed on personal characteristics

[22] For more information about the LFHS, see report Labor Force, Employment and Unemployment Statistics available on http://www.tuik.gov.tr/IcerikGetir.do?istab_id=134.
[23] The social security registration of the workers as a measure of informality is included in direct methods of calculating informality and also used by Pavcnik and Goldberg (2003), Attanasio et al. (2004), Aleman-Castilla (2006) and Henley et al. (2009) in their studies.
[24] One category is dropped in order to prevent multicollinearity. In fact many sectors in the data set are combined and this combination results in remaining nine sector categories. Among them, one category of combined sectors is dropped (electricity, gas and water supply) since in 2001; all people in this category are reported as working formally.

and sectoral dummies as in the work of Pavcnik and Goldberg (2003). I will also apply linear probability model with weighted least squares and probit regressions for robustness purposes due to several theoretical problems associated with the LPM (heteroskedasticity, and the fact that fitted, i.e. predicted probabilities may lie outside the range of 0 and 1).

We will define the regression model as follows:

$$P(informal) = y = Z\delta + X\beta + \varepsilon \qquad (1)$$

In the model, the dependent variable is the probability of being formal (y=0) or informal (y=1) (i.e. having a social security registration or not). $\boldsymbol{Z}$ includes variables of personal characteristics and area of residence of the individual, where the variables are listed as follows:

Gender (male): This variable is assigned the value of 0 if the individual is female, and 1 if male. Existing literature does not have a common ground related with the effect of this variable on probability of formal or informal employment. For instance, while Maloney (2004) states that women are over-represented in the informal labor markets of developing countries, Pavcnik and Goldberg (2003) and Aleman-Castilla (2006) argue that men are more likely to be employed informally in Colombia and Mexico.

Age (age_groups): We have 12 age categories in the data set. The first category is eliminated since it includes individuals who are below the age of 15 and are out of the labor force according to the definition of TURKSTAT. The second category includes people who are between the ages of 15 and 19. The remaining categories are constructed with 4 year intervals as in the second category (for example the third category consists of individuals who are between the ages of 25 and 29 etc.). Only the last category includes a wider range; this

category includes all people who are 65 years old and above. The literature expresses that young people are generally employed informal[25]. Bulutay and Taştı (2004) confirm this for Turkey; they state that people in younger ages are more likely to be employed informally. However there are some works which express that the effect of age on the probability of informal employment is not very clear. For example, Maloney (2004) stresses that people in older ages may desire to be self employed after accumulating experience in formal works so that the effect of age on the probability of formal or informal employment can be difficult to evaluate.

age_groups2: This variable is calculated by taking the square of age_groups variable in order to see the marginal effect of age increase, whether it has a decreasing or increasing contribution to the probability of working informally.

Level of education (educlev): In the data set, we have 7 categories of education levels; illiterate, incomplete basic education, primary school, secondary and vocational education, general high school, vocational high school and tertiary education (faculty, university and masters/PhDs.). Individuals with no, or minimum education are mostly expected to be informal wage employees[26]. The works of Bulutay and Taştı (2004) and Pavcnik and Goldberg (2003) confirm this; the effect of education is found to be negative in informal employment in their studies.

Marital status (married): People who are married during the period of the survey are assigned the value of 1 and other people are assigned the value of 0. The effect of marital status of workers on the probability of formal or informal

[25] See Jütting et al. (2008) for more information related with the literature.
[26]See report "Informal Employment Reloaded" byJütting et al. (2008) for more detailed literature survey about education available at www.oecd.org/dataoecd/4/7/39900874.pdf

employment is also uncertain in the literature. For example Pavcnik and Goldberg (2003) find that marriage is an important determinant of informal working and married people are more likely to be employed informally in Brazil and Colombia whereas Perotti and Puerta (2009) observe that married people are more likely to be employed formally in Bulgaria.

Region of residence (urban): This variable stands for the area of residence of the individual. If the individual lives in a city, it is assigned the value 1 and 0 otherwise (if he or she lives in the rural area). Bulutay and Taştı (2004) states that in urban areas educated people are more likely to be employed formally compared to less educated people. By adding this variable into regressions, we will be able to evaluate the individual effect of living area in the probability of informal employment.

The ***X*** vector includes our eight sectors: agriculture, forestry, hunting and fishing (**agr)**, mining and quarrying (**min**), manufacturing (**manuf**), construction (**cons**), wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods, hotels and restaurants (**whole**), transportation, communication and storage (**trans**), financial intermediation, real estate, renting and business activities(**fin**) and other social, community and personal service activities; public administration and defense; compulsory social security, excluding armed forces; education; health and social work (**social**)[27].

[27] From now on, we will use names agriculture sector for "agriculture, forestry and fishing", "wholesale sector" for "wholesale and retail trade, repair of motor vehicles, motorcycles and personal and household goods, hotels and restaurants", "transportation" for "transportation, communication and storage", "financial sector" for "financial intermediation, real estate, renting and business activities" and "social sector" for "other social, community and personal service activities; public administration and defense; compulsory social security, excluding armed forces; education; health and social work" instead of writing the whole group of sectors each time in order to save space.

4.1. Some Preliminary Evidence

The Table 4.1.1 presents the informal share of the workers for the related variables. We see that, in all years, informal share of working women in female employment is higher than the working men in male employment. Over the period, we also observe that the informality shares of both men and women decreases generally; but the increase in informal shares for both men and women in 2001 (crisis year) is remarkable. Single people also have higher shares of informal employment compared to married people. The people who work in urban areas tend to have higher shares of informal employment compare to rural areas.

The distinction among sectors in terms of informal employment shares is also noteworthy. For instance, the percentage of informally employed people in agriculture is higher than other sectors; approximately 90% of the people in this sector work informally. Construction sector also has high shares of informal employment; but not as much as agriculture does. The informal employment share in this sector tends to be stable; roughly 60% during the period. Wholesale and transportation sectors have relatively low shares of informal employment compared to agriculture and construction; but their level is higher than that in manufacturing, finance, social sector and mining. The informal employment shares of financial sector and social sector are similar to each other and follow similar patterns. Mining sector has the lowest share of informal employment share among all sectors, and this share does not exceed 16% over the whole period.

Informal employment share decreases as with more education. For example, the informal employment share of illiterate people is generally higher than 90% during the period and this share is below 10% for the people with

tertiary education. It means that while 9 of 10 illiterate people are employed informally, only 1 of 10 people with high education is employed informally.

The informal employment shares with respect to age groups are also essential to evaluate; since one cannot say that "as age increases, informal share of workers decreases or increases". The table shows us that informal employment shares decrease as people get older but until up to the ages of 30-34; then it starts to increase. The lowest informal employment share belongs to people who are between 30 and 35. The people, who are between 15 and 19 and above 65, have similar levels of informal employment shares between 2000 and 2006.

Table 4.1.1. Informal employment share of the variables[28] (%)

Group	Variable	2000	2001	2002	2003	2004	2005	2006	2007	2008
worker characteristics	male	45	46	45	45	47	44	43	40	38
	female	70	74	73	72	71	68	66	61	59
	married	48	50	49	49	50	48	47	44	43
	not married	61	63	63	61	62	58	55	49	45
	urban	74	76	73	74	74	69	68	69	68
	rural	29	32	34	33	36	36	35	34	31
working sector	agr	89	92	90	91	90	88	87	88	88
	min	9	8	12	15	14	13	16	15	13
	manuf	27	28	32	31	31	32	32	30	26
	cons	66	62	62	64	66	64	62	60	56
	whole	38	40	43	42	44	44	43	42	40
	trans	31	33	34	34	39	39	40	38	36
	fin	14	16	19	20	21	21	20	18	16
	social	11	12	14	14	17	18	18	18	17

[28] For example, in 2000 the value of the male variable is 45. This means that 45% of male workers are working informally.

Table 4.1.1. Informal employment share of the variables (%)(cont'd)

education level	illiterate	89	94	94	95	94	94	95	95	94
	incomplete basic education	84	85	84	88	87	86	86	87	86
	primary school	61	63	64	65	64	61	60	56	55
	secondary and vocational education	40	42	45	47	50	51	50	49	48
	general high school	25	27	28	29	32	31	32	30	28
	voc. high school	22	24	24	25	27	27	25	24	22
	tertiary education	5	7	8	8	9	10	9	10	9
age	15-19	79	84	86	86	86	84	82	79	76
	20-24	57	62	62	60	63	57	54	48	44
	25-29	43	46	45	43	45	41	40	34	31
	30-34	40	40	40	40	43	39	37	33	31
	35-39	40	41	40	41	42	40	38	35	34
	40-44	38	39	39	40	43	41	40	36	35
	45-49	46	48	48	49	49	48	47	47	45
	50-54	56	62	61	60	61	60	61	60	60
	55-59	66	68	71	74	71	72	73	74	73
	60-64	70	77	77	83	80	80	81	84	84
	65 and above	81	86	83	88	85	85	85	89	90

Source: LFHS

In the following section, we will be concentrating on workers' characteristics and sector of employment in terms of probability of working formal or informal using LPM and Probit[29] in order to see the individual effects of the related variables.

4.2. Effects of Worker's Characteristics and Working Sectors on Being Formal or Informal using LPM and Probit Regression

In this section we want to evaluate workers' characteristics and the sector of employment on the probability of being informal. Using the LPM and Probit

[29] I have also used LPM with Weighted Least Squares for robustness purposes. Results suggest that some of the values of coefficients in some years have opposite signs compare to LPM and probit (for example urban coefficient in 2000 and 2005 has a positive sign; meaning that people who live in urban areas are more likely to be employed informally, which is an unexpected result compare to LPM and Probit). This sharp distinction probably stems from the adjustments method (WLS) because adjustment method may result in some problems like substantial increases in the magnitude of most coefficients as well as increases the usual measure of R^2 (see Debertin, Pagoulatos and Smith (1980) for more information). For this reason, I prefer to use the coefficients that are derived from LPM in the rest of thesis rather than LPM with WLS (Probit regression results are very similar to each other as in the study of Pavcnik and Goldberg (2003)).

Regressions[30], we get the summary statistics presented in the Table 4.2.1.1 below for the period 2000-2008. In the regressions, we use weight factors for population projections provided in the data set for every year which provides us more precise interpretations about the whole labor force in Turkey.

The results (with respect to LPM regressions) are as follows:

4.2.1. Worker's Characteristics:

male: From regression results, we see that male workers are more likely to work in the formal sector compared to female workers in all of the years. This can be attributed to the dominant role of men in the family for the responsibility of the household. That is, the male worker has to provide basic needs of all members of the family; he has to work, provide health care services etc. In this manner, one can expect that the male worker is likely to choose the job which provides social security registration among the alternatives. Moreover, the male worker can have more opportunities to choose among the alternatives compared to female worker, since some of the jobs are predominantly male oriented. For example, the male worker can work in mining or in construction sector, but the female worker is less likely to work in these kinds of jobs. Additionally, informal employment can be more preferable by women since they provide flexibility to be involved in family responsibilities. The regression results related to male variable are contradictory with the results of Pavcnik and Goldberg (2003) and Aleman-Castilla (2006), who find that men are more likely to be employed informally in Colombia and Mexico; but comply with the assessment of Maloney (2004).

[30] Pavcnik and Goldberg (2003) use linear probability model in their regressions. Although they check their results with probit regressions, they continue to use linear probability model stating that the results are very similar to each other.

age_groups: Elder people tend to work formally more compared to younger people and this feature is more apparent especially after 2005. This result supports the findings of Bulutay and Taştı (2004). Increase in age groups has a decreasing level of contribution to formal employment. The regression result related with age variable may be attributed to the fact that the first aim of people in younger ages is to find a job. But as they get older, they probably prefer to or look for the jobs that provide social security due to the concerns of family and retirement.

educlev: Education level of people also seems to be an important factor for working formally. The regression results in the Table 4.2.1.1 shows us that higher educated people tend to work more formally in both regression models and for all years generally[31]. This result complies with the findings of Bulutay and Taştı (2004) for Turkey, Pavcnik and Goldberg (2003) for Brazil and Colombia and Aleman-Castilla (2006) for Mexico. It is highly possible that education provides more skills and more opportunities to people and they have more choices of jobs compared to people who are less educated. Moreover, one can also think that higher educated people have more qualifications compared to less educated and less skilled people so that employers may tend to provide formal jobs to those people in order to prevent their leave. For example, it is more likely that an engineer is employed formally compared to a manual worker if they both work in the construction sector.

[31] It is also true for LPM with WLS except that year 2000, where the coefficient is negative.

Table 4.2.1.1. Effects of Worker's Characteristics and Working Sector on Probability of Being Informal

Variable	LPM			Probit		
	2000	2001	2002	2000	2001	2002
constant	0.834*** (0.0006)	0.860*** (0.0007)	0.994*** (0.0007)	1.470*** (0.0025)	1.880*** (0.0030)	2.200*** (0.0029)
male	-0.086*** (0.0002)	-0.083*** (0.0002)	-0.101*** (0.0002)	-0.425*** (0.0009)	-0.504*** (0.0009)	-0.537*** (0.0009)
age_groups	-0.087*** (0.0002)	-0.099*** (0.0002)	-0.118*** (0.0001)	-0.324*** (0.0007)	-0.429*** (0.0008)	-0.476*** (0.0008)
age_groups2	0.005*** (0.0000)	0.006*** (0.0000)	0.007*** (0.0000)	0.019*** (0.0001)	0.025*** (0.0001)	0.030*** (0.0001)
educlev	-0.068*** (0.0001)	-0.068*** (0.0001)	-0.073*** (0.0002)	-0.286*** (0.0003)	-0.303*** (0.0003)	-0.299*** (0.0003)
married	-0.058*** (0.0002)	-0.051*** (0.0002)	-0.057*** (0.0002)	-0.235*** (0.0010)	-0.206*** (0.0011)	-0.220*** (0.0010)
urban	-0.046*** (0.0002)	-0.006*** (0.0002)	-0.014*** (0.0002)	-0.138*** (0.0009)	-0.010*** (0.0009)	-0.045*** (0.0009)
agr	0.550*** (0.0003)	0.593*** (0.0003)	0.530*** (0.0003)	1.892*** (0.0014)	2.123*** (0.0014)	1.857*** (0.0014)
min	-0.056*** (0.0013)	-0.058*** (0.0012)	-0.040*** (0.0011)	-0.147*** (0.0066)	-0.259*** (0.0066)	-0.106*** (0.0052)
manuf	0.040*** (0.0003)	0.040*** (0.0003)	0.052*** (0.0003)	0.265*** (0.0013)	0.244*** (0.0013)	0.259*** (0.0012)
cons	0.440*** (0.0004)	0.410*** (0.0004)	0.400*** (0.0004)	1.479*** (0.0016)	1.393*** (0.0017)	1.343*** (0.0017)
whole	0.170*** (0.0003)	0.180*** (0.0003)	0.190*** (0.0003)	0.721*** (0.0013)	0.743*** (0.0013)	0.741*** (0.0012)
trans	0.142*** (0.0004)	0.156*** (0.0004)	0.149*** (0.0004)	0.685*** (0.0017)	0.736*** (0.0017)	0.685*** (0.0017)
fin	0.030*** (0.0005)	0.037*** (0.0005)	0.040*** (0.0005)	0.234*** (0.0023)	0.283*** (0.0022)	0.273*** (0.0021)
Number of Observations[32]	84.038 (21.489.440)	85.318 (21.429.291)	85.078 (21.250.491)	84.038 (21.489.440)	85.318 (21.429.292)	85.078 (21.250.492)
R^2 and Pseudo-R^2	**0.450**	**0.477**	**0.435**	**0.385**	**0.426**	**0.386**

Standard errors are in parenthesis.
*** indicates the explanatory variable is significant at 1% significance level. ** indicates the explanatory variable is significant at 5% significance level. R^2 stands for the coefficient of determination of LPM and LPM with WLS. Pseudo-R^2 stands for the coefficient of determination in probit regression. Dependent variable is "social security coverage".

[32] Since we have used population weights for the sample, number of observations for each year tends to become as in the parentheses.

Table 4.2.1.1. (cont'd)

	LPM			Probit		
Variable	**2003**	**2004**	**2005**	**2003**	**2004**	**2005**
constant	0.991*** (0.0006)	1.000*** (0.0006)	1.369*** (0.0010)	2.296*** (0.0027)	2.178*** (0.0026)	3.421*** (0.0040)
male	-0.088*** (0.0002)	-0.092*** (0.0002)	-0.106*** (0.0002)	-0.491*** (0.0009)	-0.464*** (0.0009)	-0.491*** (0.0008)
age_groups	-0.124*** (0.0001)	-0.111*** (0.0002)	-0.163*** (0.0002)	-0.537*** (0.0008)	-0.447*** (0.0008)	-0.630*** (0.0010)
age_groups2	0.008*** (0.0000)	0.007*** (0.0000)	0.008*** (0.0000)	0.036*** (0.0001)	0.029*** (0.0001)	0.034*** (0.0001)
educlev	-0.075*** (0.0001)	-0.077*** (0.0001)	-0.080*** (0.0001)	-0.308*** (0.0003)	-0.304*** (0.0003)	-0.301*** (0.0002)
married	-0.060*** (0.0002)	-0.070*** (0.0002)	-0.069*** (0.0003)	-0.225*** (0.0010)	-0.265*** (0.0010)	-0.246*** (0.0010)
urban	-0.008*** (0.0002)	-0.012*** (0.0002)	-0.011*** (0.0002)	-0.030*** (0.0009)	-0.041*** (0.0008)	-0.034*** (0.0008)
agr	0.545*** (0.0003)	0.510*** (0.0003)	0.469*** (0.0003)	1.912*** (0.0014)	1.736*** (0.0013)	1.580*** (0.0013)
min	-0.049*** (0.0013)	-0.079*** (0.0012)	-0.118*** (0.0012)	-0.042*** (0.0058)	-0.175*** (0.0051)	-0.341*** (0.0049)
manuf	0.044*** (0.0003)	0.023*** (0.0003)	0.017*** (0.0003)	0.242*** (0.0012)	0.139*** (0.0012)	0.138*** (0.0011)
cons	0.410*** (0.0004)	0.393*** (0.0004)	0.365*** (0.0004)	1.371*** (0.0017)	1.257*** (0.0016)	1.180*** (0.0015)
whole	0.181*** (0.0003)	0.178*** (0.0003)	0.158*** (0.0003)	0.718*** (0.0012)	0.653*** (0.0011)	0.593*** (0.0011)
trans	0.145*** (0.0004)	0.157*** (0.0004)	0.151*** (0.0004)	0.672*** (0.0017)	0.638*** (0.0016)	0.615*** (0.0015)
fin	0.055*** (0.0005)	0.032*** (0.0005)	0.025*** (0.0005)	0.361*** (0.0020)	0.227*** (0.0019)	0.206*** (0.0018)
Number of Observations[33]	80.780 (21.047.648)	136.300 (21.707.579)	140.457 (21.966.068)	80.780 (21.047.649)	136.300 (21.707.579)	140.457 (21.966.068)
R^2 **Pseudo-R^2**	**0.445**	**0.410**	**0.378**	**0.397**	**0.360**	**0.329**

Standard errors are in parenthesis.
*** indicates the explanatory variable is significant at 1% significance level. ** indicates the explanatory variable is significant at 5% significance level. R^2 stands for the coefficient of determination in LPM. Pseudo-R^2 stands for the coefficient of determination in probit regression. Dependent variable is "social security coverage".

married: The probability that married people work informally is lower compared to single people for all years. The reason for this fact can be that married people have more chance to search and choose formal jobs (especially if their husbands or wives are working). They may also prefer to search more among the jobs and work formally since the responsibilities of married people in their families are higher compared to single people. They have to provide social security not only

[33] Since we have used population weights for the sample, number of observations for each year tends to become as in the parentheses.

for themselves but also for their spouses and for their children (if they have). This result complies with the findings of Aleman-Castilla (2006) for Mexico.

Table 4.2.1.1. (cont'd)

	LPM			Probit		
Variable	**2006**	**2007**	**2008**	**2006**	**2007**	**2008**
constant	1.132*** (0.0007)	1.150*** (0.0008)	1.100*** (0.0008)	2.447*** (0.0025)	2.565*** (0.0030)	2.486*** (0.0029)
male	-0.111*** (0.0002)	-0.099*** (0.0002)	-0.100*** (0.0002)	-0.498*** (0.0008)	-0.451*** (0.0008)	-0.459*** (0.0008)
age_groups	-0.142*** (0.0001)	-0.153*** (0.0002)	-0.145*** (0.0002)	-0.538*** (0.0007)	-0.611*** (0.0008)	-0.597*** (0.0008)
age_groups2	0.010*** (0.0000)	0.011*** (0.0000)	0.011*** (0.0000)	0.038*** (0.0001)	0.047*** (0.0001)	0.047*** (0.0001)
educlev	-0.083*** (0.0001)	-0.079*** (0.0001)	-0.076*** (0.0001)	-0.308*** (0.0002)	-0.294*** (0.0002)	-0.290*** (0.0002)
married	-0.057*** (0.0002)	-0.045*** (0.0003)	-0.037*** (0.0002)	-0.203*** (0.0009)	-0.158*** (0.0010)	-0.137*** (0.0010)
urban	-0.019*** (0.0002)	-0.032*** (0.0002)	-0.038*** (0.0002)	-0.063*** (0.0008)	0.109*** (0.0009)	-0.132*** (0.0009)
agr	0.435*** (0.0003)	0.422*** (0.0004)	0.425*** (0.0003)	1.468*** (0.0007)	1.430*** (0.0013)	1.420*** (0.0013)
min	-0.095*** (0.0011)	-0.110*** (0.0011)	-0.108*** (0.0012)	-0.250*** (0.0046)	-0.288*** (0.0046)	-0.306*** (0.0050)
manuf	0.012*** (0.0003)	0.001*** (0.0003)	-0.017*** (0.0003)	0.124*** (0.0011)	0.095*** (0.0011)	0.026*** (0.0012)
cons	0.333*** (0.0004)	0.320*** (0.0004)	0.287*** (0.0004)	1.080*** (0.0015)	1.034*** (0.0015)	0.947*** (0.0015)
whole	0.144*** (0.0003)	0.136*** (0.0003)	0.130*** (0.0003)	0.548*** (0.0011)	0.526*** (0.0011)	0.508*** (0.0011)
trans	0.156*** (0.0004)	0.137*** (0.0004)	0.126*** (0.0004)	0.622*** (0.0015)	0.563*** (0.0015)	0.531*** (0.0016)
fin	-0.002*** (0.0004)	-0.0138*** (0.0004)	-0.028*** (0.0004)	0.095*** (0.0017)	0.064*** (0.0017)	-0.005** (0.0017)
Number of Observations[34]	142.800 (22.236.997)	137.762 (20.639.881)	139.168 (21.102.287)	142.800 (22.236.998)	137.762 (20.639.881)	139.168 (21.102.287)
R^2	**0.368**	**0.364**	**0.392**	**0.320**	**0.323**	**0.330**
Pseudo-R^2						

Standard errors are in parenthesis. *** indicates the explanatory variable is significant at 1% significance level. ** indicates the explanatory variable is significant at 5% significance level. R^2 stands for the coefficient of determination of LPM. Pseudo-R^2 stands for the coefficient of determination of probit regression. Dependent variable is "social security coverage".

urban: The results of the regressions also suggest that people who live in urban areas are more likely to have social security coverage compared to people who live in rural areas[35]. This can be related to the variety of work opportunities in the urban areas compared to rural areas, holding all other things constant.

[34] Since we have used population weights for the sample, number of observations for each year tends to become as in the parentheses.

[35] LPM with WLS regression results show us that in 2001, 2005 and 2006, the coefficient of the urban dummy turns out to be positive, which is an unexpected result, as in the case of education level variable for 2000.

Moreover, compositions of the working sectors may differ in urban and rural areas. For example, in rural areas numbers of farmyards are much higher than the urban areas so that it is more likely to have agriculture as the dominant sector compared to an urban area. Besides, one can also think that government controls and labor laws are more likely to be enforced by legal authorities in urban areas than rural areas which can increase the probability of formal employment in urban areas.

4.2.2. Sector of Employment:

Table 4.2.1.1 also shows us that the individual's sector of employment plays a statistically significant role in influencing the probability of being formal or informal compared to the base sector (social sector)[36]. The social sector, which includes public administration and defense; compulsory social security, excluding armed forces; education; health and social work and other social, community and personal service activities is chosen as the base sector of employment and the following interpretation for each sector is in relation to this base sector.

Agriculture, forestry, hunting and fishing (agr): When we look at the magnitude of the coefficient "agr" from LPM regression we see that it ranges from 0.442 (in 2007) to 0.593 (2001). This suggests that people working in this sector are more likely to be employed informally compared to those in the social sector in all years. Although there are no empirical details that would allow

[36] The main reason for choosing social sector is the size of government role which helps us to differentiate the social sector from the compared sector. Moreover, in order to have reliable t-statistics in the regressions, one should have a base year with large number of observations (social sector employs approximately 17% of the workers) which makes less willing to choose mining, construction, transportation and finance as base sector (their shares in employment are less than 7% in all years). Apart from the fact that all sectors are statistically different from the base sector at 5% significance, joint significance tests of the sector dummies indicate that sectors are jointly significant in the probability of informal working for all models and for all years.

interpretation of this finding, it is a known fact that people who are working in the agricultural sector, especially in rural areas, most of the time do so on their own or family land/ business or work as unpaid family workers on these plots. As such they are not always governed by legal regulations (i.e. social security registration payments) making it more probable that a person is employed informally in the agriculture compared to a person (with the same observable characteristics) in the social sector.

Manufacturing (manuf): The regression results show that people who work in the manufacturing sector are expected to be employed more informally compared to the base sector. One of the possible reasons may be that when we look at the composition of the sectors of the social sector is more likely to be controlled and regulated by the government (especially the sectors of public administration, health and education) compared to the manufacturing sector. The high level of government role and intervention are capable to create a positive effect for a sector to employ formal people compared to a less intervened one.

Mining (min): The results for most of the years suggest that the probability of an individual working in the mining sector to be employed formally is higher compared to those people working in the social sector[37]. This result can be attributed to the share of government in mining sector. Although we do not have detailed information about the share of the government in mining sector for the evaluated period, Uzunoğlu (2005) states that government operates in 85 of the sector which provides us an insight related with the difference in probabilities of informal employment between sectors.

[37] Although the LPM and Probit regressions suggest that this finding is valid throughout the dataset, LPM with WLS does not confirm this conclusion; in 2000, 2003 and 2008, social sector becomes more formal compare to mining sector.

Construction (cons): The probability of being informal in this sector is also statistically different than that of the social sector and an individual working in the construction sector is more likely to be informally employed compared to those working in the social sector. For example, an average person can work as manual worker in case of losing his job since it does not necessitate high qualifications, which make construction sector a good alternative to work.

Wholesale (whole): The regression results show that people who work in the wholesale sector are more likely to be employed more informally compared to the base sector. When one looks at the composition of the wholesale sector, it can be seen that most of the sectors can be thought as the ones with high turnover rates (for example wholesale, retail trade, hotels and restaurants). So, one of the possible explanation of the difference between the base sector and wholesale sector is that employers may not be very eager to employ people formally for jobs that have high turnovers.

Transportation (trans): Results suggest that the probability of an individual working in the transportation sector being informal is higher than for those working in the base sector. Although there are no investigational details to permit understanding of the finding, one possibility is that transportation may have higher rates of turnover compared to social sector. Moreover, difference of the share of government between sectors may cause the difference in probability of formal employment.

Finance (fin): For the period 2000-2005, regression results show that financial sector is more informal compared to social sector[38]. However, for the remaining period (2006-2008), LPM results show that this sector becomes more

[38] It is similar for LPM with WLS models in other years as well, but coefficient of financial sector in probit regression also changes in 2008 and this sector becomes more formal compare to social sector in this year.

informal compared to social sector. All these complicated structure of the financial sector can be a sign for a (dominant) structural change in the financial sector compare to social sector for the evaluated period.

Although LPM is weak in providing efficient estimates theoretically, the results of both LPM with WLS and Probit regressions generally support the results from LPM regressions. These similar results give us insight to support the preference of LPM of Pavcnik and Goldberg (2003). However, I also find the related marginal probabilities from probit model in order to have a general idea of the marginal effects of the regressions. The results of probit regression and marginal probabilities are presented in the Table 4.2.2.1.

The marginal effects from probit regression are very similar to the LPM model, both for workers' characteristics and the working sectors in all years except for the financial sector. That is, the coefficient of this sector in 2006, 2007 and 2008 are negative in LPM, it is negative only in year 2008 in probit regression.

Table 4.2.2.1. Marginal Probabilities[39]:

Variable	2000	2001	2002	2003	2004
male	-0.1085*** (0.0002)	-0.1228*** (0.0002)	-0.1352*** (0.0002)	-0.1224*** (0.0002)	-0.1167*** (0.0002)
age_groups	-0.0796*** (0.0002)	-0.1008*** (0.0002)	-0.1162*** (0.0002)	-0.1301*** (0.0002)	-0.1102*** (0.0002)
age_groups2	0.0046*** (0.0000)	0.0060*** (0.0000)	0.0072*** (0.0000)	0.0086*** (0.0000)	0.0071*** (0.0000)
educlev	-0.0708*** (0.0001)	-0.0714*** (0.0001)	-0.0731*** (0.0001)	-0.0747*** (0.0001)	-0.0751*** (0.0001)
married	-0.0594*** (0.0003)	-0.0494*** (0.0003)	-0.0544*** (0.0003)	-0.0551*** (0.0003)	-0.0663*** (0.0002)
urban	-0.0351*** (0.0002)	-0.0025*** (0.0002)	-0.0111*** (0.0002)	-0.0075*** (0.0002)	-0.0103*** (0.0002)
agr	0.5445*** (0.0003)	0.5752*** (0.0003)	0.5160*** (0.0003)	0.5248*** (0.0003)	0.4899*** (0.0003)
min	-0.0390*** (0.0016)	-0.0632*** 0.0015)	-0.0297*** (0.0013)	-0.0141*** (0.0014)	-0.0464*** (0.0012)
manuf	0.0618*** (0.0003)	0.0532*** (0.0003)	0.0589*** (0.0003)	0.0545*** (0.0003)	0.0308*** (0.0003)
cons	0.3706*** (0.0003)	0.3290*** (0.0003)	0.3174*** (0.0003)	0.3266*** (0.0003)	0.2928*** (0.0003)
whole	0.1709*** (0.0003)	0.1681*** (0.0003)	0.1729*** (0.0003)	0.1676*** (0.0003)	0.1529*** (0.0003)
trans	0.1681*** (0.0004)	0.1708*** (0.0004)	0.1624*** (0.0004)	0.1595*** (0.0004)	0.1510*** (0.0004)
fin	0.0554*** (0.0006)	0.0638*** (0.0005)	0.0633*** (0.0005)	0.0846*** (0.0005)	0.0528*** (0.0005)

Table 4.2.2.1. Marginal Probabilities (cont'd)

Variable	2005	2006	2007	2008
male	-0.1291*** (0.0002)	-0.1323*** (0.0002)	-0.1191*** (0.0002)	-0.1194*** (0.0002)
age_groups	-0.1620*** (0.0002)	-0.1400*** (0.0002)	-0.1582*** (0.0002)	-0.1511*** (0.0002)
age_groups2	0.0087*** (0.0000)	0.0099*** (0.0000)	0.0122*** (0.0000)	0.0119*** (0.0000)
educlev	-0.0777*** (0.0001)	-0.0804*** (0.0001)	-0.0761*** (0.0001)	-0.0737*** (0.0001)
married	-0.0642*** (0.0003)	-0.0531*** (0.0002)	-0.0412*** (0.0003)	-0.0352*** (0.0002)
urban	-0.0091*** (0.0002)	-0.0168*** (0.0002)	-0.0282*** (0.0002)	-0.0335*** (0.0002)
agr	0.4553*** (0.0003)	0.4269*** (0.0003)	0.4179*** (0.0004)	0.4190*** (0.0004)
min	-0.0897*** (0.0012)	-0.0679*** (0.0012)	-0.0772*** (0.0011)	-0.0788*** (0.0012)
manuf	0.0321*** (0.0003)	0.0288*** (0.0003)	0.0204*** (0.0003)	0.0031*** (0.0003)
cons	0.2892*** (0.0003)	0.2710*** (0.0003)	0.2640*** (0.0004)	0.2426*** (0.0004)
whole	0.1456*** (0.0003)	0.1365*** (0.0003)	0.1305*** (0.0003)	0.1248*** (0.0003)
trans	0.1525*** (0.0004)	0.1564*** (0.0004)	0.1419*** (0.0004)	0.1329*** (0.0004)
fin	0.0499*** (0.0005)	0.0216*** (0.0005)	0.0125*** (0.0004)	-0.0047*** (0.0004)

[39] Standard errors are in parenthesis. *** indicates the explanatory variable is significant at 1% significance. Dependent variable is "social security coverage".

The above results only allow for interpretations about each sector relative to the base sector. That is, the coefficients of the sectors from regression tables only show us whether there is a statistical significance between the sector evaluated and the base sector in probability of informal employment. The difficulty of comparisons across all sectors stems from the fact that regressions do not tell us much about the overall evolution of the absolute informality in a specific sector or in the overall economy. The following section will deal with this issue by providing a "well-defined average[40]" probability measure for each sector which will allow investigation of the sectoral differences in a clearer way.

4.3. Renormalization of Informality Differentials[41]

Our estimation model in more explicit terms is:

$$Yijt = Zijt*\delta it + Xijt*\beta jt + \mathcal{E}ijt \qquad (1)$$

Here, ***Yijt*** stands for a worker i in sector j in year t. This value is 1 if the worker works informally. ***δit*** represents the coefficient vector of worker characteristics ***Z,*** and ***βjt*** represents the specific coefficients of sector indicators ***X,*** indicating the workers' sector affiliation.

The coefficient on the sector dummy ***βjt*** captures the part of variation in informal employment that cannot be explained by worker characteristics, but can be explained by the worker's sector affiliation. These coefficients are labeled as "informality differentials". These coefficients are obtained from the first stage

[40] See Suits (1984) and Kennedy (1986). They suggest finding the coefficients by using an appropriate procedure and then express those coefficients as deviations from a "well defined average". In this way, they are also able to include the base category so that the interpretation of the model is more convenient. In this manner, many authors, for example Krueger and Summers (1988), Haisken DeNew and Schmidt (1997), Pavcnik and Goldberg (2005) in labor economics, uses an employment share weighted mean for this "well defined average". We will follow an approach similar to Pavcnik and Goldberg (2003).

[41] This part of the thesis heavily depends on Haisken De-New and Schmidt (1997).

regressions, estimated with the LPM. These coefficients do not provide information on the overall level of informality and its absolute evolution over time in a sector, but rather shows whether a sector is statistically different from the base sector in explaining the variation in the probability of informal employment. So, the need for normalization of the estimated coefficients which will allow comparison across sectors and time is evident, it is important since the interpretation of the coefficients may sometimes be problematic especially when one uses dummy variables as independent variables as in our case.

In this manner, I will follow the method of Krueger and Summers (1988), who use a normalization technique to explicitly express industry differentials as deviations from a hypothetical employment share mean (a well-defined average). These normalized coefficients are measured using the coefficients from the first stage estimation, Equation **(1)**. The method is as follows:

Suppose that one has a regression model as above:

$$\boldsymbol{y = Z\delta + X\beta + \varepsilon} \qquad \textbf{(1)}$$

where y is an (n x 1) vector of the dependent variable, Z is an (n x g) matrix of regressors (in our model it will be our set of worker's characteristics such as education, gender, age…), X is an (n x (k+1)) containing a constant term as its first element and k indicators for groups (sector dummies in our case). δ and β are (g x 1) and ((k+1) x 1) vectors of parameters, respectively, and ε is an (nx1) vector of random errors[42]. In the estimation procedure, one has to put a restriction on the vector $\boldsymbol{X}$ to avoid multicollinearity.

In order to express the individual sector coefficients as deviations from a well defined average, the stages of the method are as follows:

[42] This paragraph is directly from Haisken DeNew and Schmidt (1997).

First one solves the restrictions out of the model by dropping one of the group indicators from the regression, say the *k*th indicator. Then perform the regression[43] to receive the estimated coefficient vectors for δ and β, *d (coefficients of Z)* and *b (coefficients of X)* respectively. Here $b= (b_0, b_1,...,b_{k-1}, 0)$' where b_0 stands for the constant term and 0 is for the base sector dummy.

In the second step, one normalizes the coefficients *b* which is obtained from the first stage estimation. The normalization is obtained by forming linear combinations as follows:

$$b^* = Ib - Wb, \qquad \textbf{(2)}$$

where I is (k+1) x(k+1) identity matrix and $W=(w,w,...,w)$' is a matrix formed by the weights of the sectors in each row, where $w=(0, w_1, w_2,\ldots,w_k)$ stands for the employment shares of the related sectors and wi'=1 for i= (1,1,…,1)[44]. Then it follows that

$$b^* = [I-W]b \qquad \textbf{(3)}$$

If we write a normalized coefficient for a specific sector j, we will have that

$$b_j^* = b_j - \Sigma w_j b_j \qquad \text{for } j=0,\ldots,k. \qquad \textbf{(4)}$$

where $\Sigma w_j b_j$ is the total sum of the coefficients (informality differentials) multiplied by corresponding sector employment shares. This allows us to express the coefficients b_j*s as the deviations of the estimated coefficients from a weighted mean.

[43] In the original paper Haisken DeNew and Schmidt (1997) uses ordinary least square since they want to compare their regression results and the standard errors of the normalized differentials with the Krueger and Summers (1988) who use log wages (a continues variable) as the dependent variable in regressions. Nevertheless, Pavcnik and Goldberg (2003), who apply this method to discrete variable case (they use being formal or informal as dependent variable) also create related normalized informality differentials after probit regression.

[44] Using this procedure, we will create a hypothetical sector that represents average of all industries through employment shares. The value of this sector will also be normalized to zero and the interpretations related with coefficients will be based on the deviations from this zero value of average sector.

Note also that *wb**=0 provides the average hypothetical sector. Moreover, the relevant part of the variance-covariance matrix of *b** can be calculated as:

$$V(b^*)=[I-W]V(b)[I-W]' \qquad (5)$$

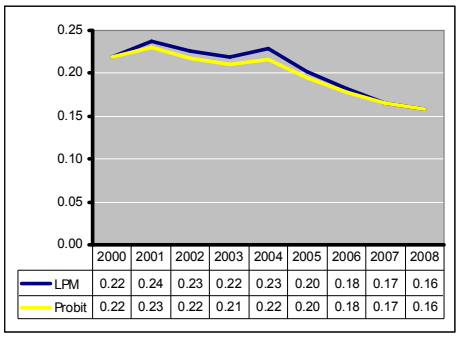
where

$$V(b) = \begin{bmatrix} \sigma_0^2 & \sigma_{01} & \cdots & \sigma_{0,k-1} & 0 \\ \sigma_{10} & \sigma_1^2 & \cdots & \sigma_{1,k-1} & 0 \\ \vdots & \vdots & \ddots & \vdots & 0 \\ \sigma_{k-1,0} & \sigma_{k-1,1} & \cdots & \sigma_{k-1}^2 & 0 \\ 0 & 0 & \cdots & 0 & 0 \end{bmatrix}.$$

Following this methodology, one can also create "a new measure" of average sectoral differences in Turkey. The sum of the employment share weighted probabilities of being informal (*wb*) for each sector should provide us an indicator for this measure[45]. This new measure is labeled as the "employment weighted average informality differential[46]". The trend of this measure reported in Figure 4.3.1 for the whole period, where each line represents a different estimation method, the LPM and Probit. The detailed results of LPM and Probit were discussed in the previous section.

[45] The level of this new measure changes according to the choice of base sector; but trend of the new measure is similar even for different base categories.
[46] This definition belongs to Pavcnik and Goldberg (2003).

Figure 4.3.1. Employment Weighted Average Informality Differentials for LPM and Probit Regressions



	2000	2001	2002	2003	2004	2005	2006	2007	2008
LPM	0.22	0.24	0.23	0.22	0.23	0.20	0.18	0.17	0.16
Probit	0.22	0.23	0.22	0.21	0.22	0.20	0.18	0.17	0.16

From the figure, we see that the differences of sectors in terms of probability of informal employment decreases during 2000-2008 and this is true for both groups of normalized differentials from LPM and Probit regressions. Additionally, LPM and Probit has nearly same levels of average of probability differences and trends for all years.

Following the methodology, the normalized coefficients, which express the deviations from the employment-weighted average informality differentials[47], and their figures, are presented in Table 4.3.1, Figure 4.3.2 and Figure 4.3.2.

[47] I also calculated the weighted average informality differentials by using the sectoral GDP over total GDP as weight. The relative differences of the sectors did not change. Only wholesale and transportation sectors were closer to the average sector but they tended to be informal with these new weights.

Table 4.3.1. Normalized Informality Differentials for LPM and Probit[48]:

	LPM			Probit		
Sector	**2000**	**2001**	**2002**	**2000**	**2001**	**2002**
agr	0.33	0.36	0.30	0.32	0.35	0.30
min	-0.27	-0.30	-0.27	-0.26	-0.29	-0.25
manuf	-0.18	-0.20	-0.17	-0.16	-0.18	-0.16
cons	0.22	0.17	0.17	0.15	0.10	0.10
whole	-0.05	-0.06	-0.04	-0.05	-0.06	-0.04
trans	-0.08	-0.08	-0.08	-0.05	-0.06	-0.06
fin	-0.19	-0.20	-0.19	-0.16	-0.17	-0.15
social	-0.22	-0.24	-0.23	-0.22	-0.23	-0.22
	LPM			**Probit**		
Sector	**2003**	**2004**	**2005**	**2003**	**2004**	**2005**
agr	0.31	0.28	0.26	0.31	0.27	0.26
min	-0.29	-0.31	-0.32	-0.23	-0.26	-0.29
manuf	-0.17	-0.21	-0.18	-0.16	-0.18	-0.16
cons	0.17	0.16	0.16	0.12	0.08	0.09
whole	-0.03	-0.05	-0.04	-0.04	-0.06	-0.05
trans	-0.07	-0.07	-0.05	-0.05	-0.06	-0.04
fin	-0.15	-0.20	-0.18	-0.13	-0.16	-0.15
social	-0.20	-0.23	-0.20	-0.21	-0.22	-0.20
	LPM			**Probit**		
Sector	**2006**	**2007**	**2008**	**2006**	**2007**	**2008**
agr	0.25	0.26	0.27	0.25	0.25	0.26
min	-0.28	-0.28	-0.27	-0.25	-0.24	-0.24
manuf	-0.17	-0.16	-0.18	-0.15	-0.15	-0.15
cons	0.15	0.15	0.14	0.09	0.10	0.08
whole	-0.04	-0.03	-0.02	-0.04	-0.04	-0.03
trans	-0.02	-0.03	-0.02	-0.02	-0.02	-0.02
fin	-0.18	-0.18	-0.19	-0.16	-0.15	-0.16
social	-0.18	-0.17	-0.17	-0.18	-0.17	-0.16

Since the normalized informality differentials are as deviations from the employment weighted mean informality differential, these normalized informality differentials can be interpreted as "the percentage point difference in probability of informal employment for a worker in a given sector relative to an average

[48] Although not reported, in both models, the normalized differentials are significant at 5% significance. Zanchi (1998) state that t-tests concerning the normalized differentials have a more straightforward and meaningful interpretation in terms of sector informality differentials. While t-tests for the industry parameters in model (1) test whether the probability of being informal for employees in each of the sectors are significantly different from the probability of being informal in base sector, t-tests for the sector coefficients in Table 4.3.1. can be used to test whether the probability of being informal in each of the total 8 sectors are significantly different from the probability of being informal for the average employee in the economy. See Zanchi (1998) for the interpretation of the normalized coefficients.

worker in all industries with the same observable characteristics"[49]. This interpretation is advantageous to the interpretation of the coefficients in the LPM and Probit model in terms of comparison. Using this methodology, one can make interpretations related with differences of probabilities of each sector in terms of formal or informal employment in the regression, even related with the base sector. It is possible because the methodology provides the inclusion of the base sector with a comparable informality level.

From Table 4.3.1 and related figures, we see that the LPM and Probit model results are very similar to each other. Moreover, as we can see from the figures clearer, some sectors have a sharp difference in terms probability of informal employment in all of the three models, where we can define as sectors with "chronic informality".

Figure 4.3.2. Normalized Informality Differentials with LPM*:

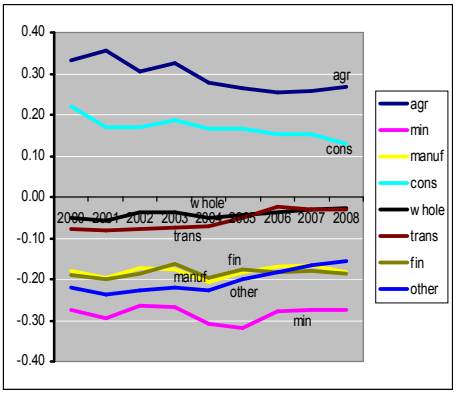
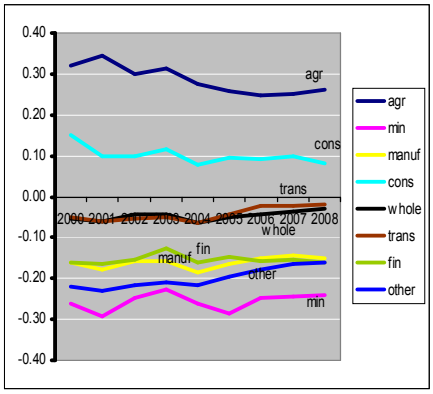


Figure 4.3.3. Normalized Informality Differentials with Probit:**



*,** other stands for the social sector

We observe that in agriculture and construction, people are more likely to be employed informally compared to all sectors in all years. Mining and social

[49] This interpretation belongs to Pavcnik and Goldberg (2003)

sectors tend to be the most formal sectors; although in probit model the level of informality difference of the social sector decreases and became very similar to financial and manufacturing sector. Wholesale and transportation sectors are the most likely sectors to represent the average of the all sectors.

The mining sector, which should be evaluated specially due to the dominant share of government, is the most formal among all the sectors. By "most formal" it is meant that the relative probability of this sector to employ people formally on average is higher compare to all sectors. For example, if a person works in the average sector (whose value is 0) and changes his or her job; the probability that he or she will be employed formally will be increased by 32 percentage point in year 2005[50] if he or she starts to work in the mining sector.

The probability differences of informal employment among sectors are generally decreasing over time in all models[51]. The percentage changes in the sectoral informality differentials in the whole period are given in the Table 4.3.2.

Table 4.3.2 shows us that two sectors, agriculture and construction, become more formal relative to the average sector over time. All other sectors also tend to converge to the "average sector"; but their formality compared to the average sector decreases over time in all models. The highest percentage changes are seen in the transportation, construction and wholesale while the changes in agriculture and social sector tend to be modest.

[50] Since the differences in the probabilities of informal employments are calculated as taking the difference from the average sector in each year, we should specify the degree of increase or decrease in the percentage point with respect to the related year.

[51] However, in LPM with WLS there is an increase in agriculture sector in 2007 and 2008; but on average agriculture has a decreasing trend for with method as well.

Table 4.3.2. Percentage change (%) in the informality differentials by sector (2000 to 2008)

Sector	LPM	Probit
agr	-18	-19
min	0	8
manuf	0	6
cons	-41	-47
whole	40	42
trans	63	60
fin	0	0
other	27	27

(-) sign shows the decrease in informality compared to average sector.

The magnitudes and the related figures of the normalized coefficients show us that there are some structural differences between the sectors that cannot be explained by workers' characteristics. In the following section, I will try to explore these "structural differences" by using the normalized differentials that are derived from the LPM.

4.4. Determinants of Sectoral Differences in Probability of Informal Employment

In this section, I will try to explore the determinants of the sectoral differences in probability of the informal employment. Firstly, I will present a short description of the methodology and associated variables that will be used in the analysis.

4.4.1. Estimation Procedure

In the second part of the thesis, I will analyze for the possible determinants of differences of informal employment at the sectoral level. The informality differentials that are derived from the first stage (normalized coefficients from

LPM) will be pooled overtime and will be regressed on a list of variables which are thought to have explanatory power for the sectoral differences of the probabilities on informal employment. The following section describes these variables that may have affected the extent of informal employment[52].

4.4.1.1. Independent Variables

Independent variables include both a set of sector specific variables and aggregate/economy-wide variables. We discuss these two groups in this order.

Group 1: Sector specific independent variables:

A. Credit availability: There are two possible channels through which the availability of credit could affect the level of informality in the economy. First, as stated in Catao et al. (2009), if firms have more opportunity to borrow money (if they are not credit constrained) they are more likely to grow and shift to the larger segments of the market and leave their previous smaller size segment which is most probably dominated by informal firms[53]. The importance of this channel is further supported by the evidence pointed out by Catao et al. (2009) regarding the prominent role of bank credit in emerging markets. They state that bank credits are by far the most important class of regulated financial intermediaries in emerging markets and developing countries regarding the provision of external

[52] Although there are many important variables that may influence the differences of probabilities in sectoral informal employment (differences tariff rates, stickiness of controls of legal authorities, fines...etc.), the need for the variables on sectoral basis and unavailability of the data restricts us to use those in the second stage of the regressions.

[53] It is highly debatable that whether the informality level of the firms affects the amount of credit borrowed or the credit they get from the banks affect the level of informality of the firms (Straub (2005) claims that informal firms are credit constrained while Catao et al. (2009) support the idea that credit constrained firms are more likely to operate informally). As anecdotal evidence, I asked a person who is responsible for giving credits to small and medium size enterprises in a well-known bank for the level of the importance of the operating formally or informally for getting credits. As he states, the important thing while giving credits is the probability of repayment; and it is mostly decided by looking at firm's revenue and its credibility. In this manner, it is hardly to say that "banks do not give credits to firms which are not paying its workers social security payments", since they are able to get credits if they are profitable and have credibility.

credit to firms. The second way in which the availability of bank credit may lead to a decrease in the probability of informal employment may occur especially when firms are credit constrained (i.e. lack liquidity). If a firm has difficulties in paying its debts, it may tend to operate informally in order to avoid the extra legal costs of being formal such as social security payments of workers and income/corporate taxes. Accordingly, I will use the bank credits extended to the sectors as a share of the sector's GDP as an indicator of credit availability. This data series is obtained from the database of the Central Bank of Turkey available online.

B. The gender composition of the industry's workforce: In the first stage analysis, the results suggest that men are more likely to be employed formally compared to women. Taking into account that males are generally the head of the households and the primary wage earners in the family, one can expect that they are more likely to search for formal jobs in order to provide health care for the whole family. As such, men are forced to look for formal jobs more rigorously than women. Carrying this argument to the sectoral level I will test whether the share of male workers in the total workforce of the sector is an important indicator influencing the level of informality of the sector[54]. The data for the gender composition of the sectors workforce is obtained from the internet site of TURKSTAT, which is derived from the Household Labor Force Surveys.

C. Sectoral GDP Growth: This variable stands for the performance of the related sector. A priori, I expect that high levels of growth rates in the related

[54] Although share of male workers in each sector is higher compare to share of female workers, there are differences between sectors in terms of probability of informal employment even the sectors have the same share of male workers. For instance, although construction and mining has nearly the same share of male workers in all years (above 95%), mining is more formal compare to construction sector. Moreover, manufacturing sector seems to be more formal compare to construction even though its share of male workers is less than construction sector. These all makes us to control for share of male workers in the sectors in the regressions.

sector will induce more employment in the sector, and most likely formally. It is because legal authorities may increase their control over the sectors which operate well and high levels of production to get more tax revenues. This threat of being caught would increase the incidence of formality in the sector[55]. Additionally, people who are working informally may have a stronger bargaining power to demand social security coverage from their employers if the sector (or firm) operates well and are making profits. Sectoral GDP data is taken from the database of the Central Bank of Turkey's online database.

D. Number of new foreign firms: The number of new foreign entrants to a specific sector can be thought of as possibly increasing the extent of formal employment. Since it is more likely for foreign firms to comply with the legal framework of the work legislation (especially when they are new entrants), it is expected that an increase in the number of foreign firms at the sectoral level will boost formal employment in the related sector. Sectoral FDI data is available only for the period 2002-2008; and obtained from the database of Undersecretariat of Treasury.

E. Price Indices for Tradable and Non-Tradable Sectors: This variable stands for the competitiveness effect between markets. I categorize agriculture, mining and manufacturing as the tradable sectors, and the remaining sectors as non-tradable sectors. The price index for the tradable goods is the producer price index and the price index for the nontradables is the consumer price index[56]. I think that the increase in the price index of a specific group will increase the profitability of the sector, and this may increase the tendency of firms operating in

[55] There are some models using the probability of being caught as a source for increasing the incidence of formality. See Dabla-Norris et al. (2008) among others.
[56] The literature widely uses these indices as proxies for tradable and non-tradable good. See Jha(2003).

that sector to hire more formal workers. This data is taken from International Finance Statistics (IFS) Database of the IMF.

Group 2: Economy-wide variables

A. GDP growth: When the economy is operating well, firms may tend to employ people more formally (probably they hire more formal workers or they employ existing informal workers as formal). It is because (in the same argument with sectoral growth rates of GDP), government is more likely to increase the number of inspections related with the informality levels of the firms and workers are expected to be more courageous to demand social security coverage compared to periods when the economy performs bad. The data is taken from the database of the Central Bank of Turkey's online database.

B. Real exchange rate: An increase in the real effective exchange rate may increase the tendency of firms to employ people informally. This can be attributed to competitiveness pressures on the sectors; with depreciation in the domestic currency, firms now selling their goods cheaper and this decreases unit revenue from the goods sold. In this manner, firms may try to increase their profits by hiring more informal workers. The data is from the database of the Central Bank of Turkey's online database.

4.4.1.2. The Second Stage Estimation Procedure

The regression I am going to estimate at this stage of the analysis is as follows:

$$ip_{jt}=T_{jt}\beta_E+D_{jt}\beta_D+u_{jt} \qquad (6)$$

where ip stands for the informality differential, T_{jt} is a vector of independent sectoral based variables enlisted above and D_{jt} is a vector of industry and/or time specific fixed effects.

It is important to note that controlling for the worker characteristics in the first stage provides us second stage results that are driven only by the sectoral characteristics of the differentials and time effects. In estimating the regression with a panel dataset we first would use the Hausman test to choose between the fixed and random effect models. However, the Hausman Test is not valid when there is (group wise) heteroskedasticity and cross sectional serial correlation in the error terms of the panel data[57]. In order to check whether there exist heteroskedasticity problems which will prevent us from using the Hausman Test, I used the Wald test for groupwise heteroskedasticity[58]. The results suggest that there is a highly significant test statistics which points to a strong groupwise heteroskedasticity[59]. Moreover, to check whether there is serial autocorrelation in the panel data[60], Wooldridge's test for serial correlation is used[61]. The test results for serial correlation states that the panel data also has a serial correlation problem across panels. Since our data has both heteroskedasticity and serial correlation problems[62] which prevent us using the Hausman Test to choose between fixed effect model and random effect model, I will use the FGLS method to estimate the equation. The reason for choosing FGLS is that Stock and Watson (2003) states

[57] See Li (2006) and discussions at http://www.stata.com/statalist/archive/2009-07/msg00099.html.
[58] See Khachatyrn et al. (2005) for a more detailed explanation on the application of the test.
[59] At 5% significance level.
[60] At 5% significance level. Because serial correlation in linear panel-data models biases the standard errors and causes the results to be less efficient. Because of this problem, researchers need to identify serial correlation in the idiosyncratic error term in a panel-data model (see Drucker (2003)).
[61] Drucker (2002) praises this test since it can be applied under general conditions (for example the test automatically conditional on heteroskedasticity) and is easy to implement.
[62] I check fort he serial correlation and heteroskedasticity for each model in the tables which will be presented below and each of them has both serial correlation and heteroskedasticity (at 5% significance level).

that it performs best when the errors are heteroscedastic and/or correlated across observations[63]. The results of the FGLS regressions are given in Table 4.4.1.2.

The regression results show us that amount of bank credit over sectoral GDP share, male worker share of the sector and real growth real of the sector are significant in determining the difference in the probability of informal employment in each model. The sign and the significance of male share variable is an expected result because from the first stage results we also have found that male workers tend to work more formally than female workers. Being head of the household, in general, of the family, forces men to work formally and the dominance of men workers in the related sector increases the probability of informal employment.

[63] See Khachatyrn et al. (2005). Moreover, FGLS also allows estimation in the presence of autocorrelation within panels and cross-sectional correlation and/or heteroskedasticity across panels (see also in Biorn (2010)). There is also a debate on the literature suggesting that in the presence of both heteroskedasticity and serial correlation one should use the method which is designed by Katz and Beck (1995). Based on MLE simulations, Katz and Beck (1995) suggest that their alternative "panel corrected standard errors (PCSE) method" performs well compare to FGLS. However, a more recent article by Chen et al. (2010) finds that the FGLS method is generally more efficient than the method of Katz and Beck (1995) even if the units and time period is small (For instance they find that out of 8 panel data set, only in one of them PCSE performs well when N=5 and T=10). Based on their suggestion, I prefer to use FGLS in the estimation process of panel data.

Table 4.4.1.2. Regression Results with Feasible Generalized Least Square (FGLS)

Variable	Feasible Generalized Least Square				
	I	II	III	IV	V
constant	-0.185*** (0.009)	0.287*** (0.047)	0.31*** (0.068)	0.328*** (0.069)	0.22*** (0.096)
credit	-0.059*** (0.014)	-0.098*** (0.020)	-0.099*** (0.019)	-0.121*** (0.018)	-0.147*** (0.027)
male_comp	-	-0.66*** (0.062)	-0.66*** (0.061)	-0.66*** (0.055)	-0.69*** (0.083)
price_ind	-	-	-0.000582 (0.00013)	-0.00009 (0.0001)	-0.0002 (0.0002)
sec_growth	-	-	-	-0.059*** (0.018)	-0.063*** (0.023)
no_firms[64]	-	-	-	-	0.000009 (0.00008)
Time dummies	YES	YES	YES	YES	YES
Sector Dummies	YES	YES	YES	YES	YES
Number of Observations	72	72	72	72	72
Time periods	9	9	9	9	9
Number of Groups	8	8	8	8	8
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000

Standard errors are in parenthesis. * indicates 1% significance level.**

The regression results also suggest that real growth of the sector is an important determinant of probability of informal employment in the related sector. Moreover, the sign of the growth rate coefficient is also negative implying that if a sector performs well (higher sectoral GDP growth rates), then probability of informal employment in that sector decreases. This result complies with my expectations related with the effect of growth of the sector; people may be braver to demand social security coverage when the firm is operating well and/or government becomes stricter in control of the informality in the well-performing

[64] It is questionable whether foreign firms enter to sectors especially which are more formal due to avoid competitiveness pressures of those informal firms in the same sector, or their entrance increases the formality of the sector. Since our number of new foreign firms is insignificant, there is no need for further search of the endogeneity.

sectors so that firms are more likely to provide social security coverage to workers.

The credit variable, which is our main concern, is significant and negative in all of the regressions. Complying with the claims of Catao et al. (2009), regression results implies that credit availability to firm/sectors is one of the determinants of the probability of working formally or informally. The magnitude of the coefficient is increasing as we control for more variables and reaches to -0.147 in the fifth regression. The magnitude of the credit variable in the fifth regression suggests that a 1 percentage point increase in the credit over sectoral GDP ratio decreases the probability of being informal by approximately 0.15 percentage points (i.e. 0.0015) in the given industry. Although the variable is statistically significant economically it seems somewhat insignificant. Additionally, in all regressions coefficients of the price index and the number of foreign firms are not significant, even in 10% significance level in determining the probability differences in informal employment of the sectors.

The year and sector dummies are included in all regressions to control for time fixed effects and sector specific effects. The problem is that even the sector dummies are significant in all regressions; year dummies are hardly so. In order to capture business cycle effects, I next use the real growth rate of GDP (gdp_growth-for capturing the performance of the overall economy) and changes in the real effective exchange rate (eff_ex-in order to control for the competitiveness of the economy in the world market). The variables of price index and number of foreign firms are not used in the second stage since they are all insignificant in first regressions which are presented in Table 4.4.1.2. The new regression results with the additional variables are presented in the Table 4.4.1.3.

Table 4.4.1.3. Feasible Generalized Least Square Regressions with additional variables of Real GDP Growth and Real Effective Exchange Rate

	Feasible Generalized Least Square			
Variable	**I**	**II**	**III**	**IV**
constant	0.28*** (0.014)	0.29*** (0.022)	0.30*** (0.022)	0.30*** (0.022)
credit	-0.035*** (0.006)	-0.040*** (0.009)	-0.042*** (0.010)	-0.044*** (0.011)
male_comp	-0.68*** (0.018)	-0.68*** (0.028)	-0.70*** (0.029)	-0.71*** (0.031)
sec_growth	-	-0.027*** (0.004)	-0.019* (0.010)	-0.019* (0.010)
gdp_growth	-	-	-0.019 (0.018)	-0.019 (0.019)
eff_ex	-	-	-	0.00006 (0.005)
agr	0.38*** (0.016)	0.37*** (0.016)	0.37*** (0.016)	0.37*** (0.016)
min	0.11*** (0.007)	0.11*** (0.010)	0.11*** (0.010)	0.11*** (0.010)
manuf	0.097*** (0.005)	0.10*** (0.006)	0.10*** (0.006)	0.10*** (0.007)
cons	0.56*** (0.013)	0.57*** (0.015)	0.57*** (0.015)	0.57*** (0.015)
whole	0.28*** (0.007)	0.28*** (0.009)	0.28*** (0.009)	0.29*** (0.009)
trans	0.30*** (0.005)	0.31*** (0.007)	0.31*** (0.007)	0.31*** (0.008)
fin	0.027*** (0.006)	0.029*** (0.006)	0.029*** (0.006)	0.028*** (0.006)
Number of Observations	72	72	72	72
Time periods	9	9	9	9
Number of Groups	8	8	8	8
Prob>chi2	0.0000	0.0000	0.0000	0.0000

Standard errors are in parenthesis. * indicates 1% significance level. * indicates 10% significance level.**

The results are similar for the same variables in both tables. The sign and significance of the coefficients of the credit and share of male variable (the effect on the probability of informal employment) do not change (although coefficients decrease in magnitude). In all of the regressions (regressions in Table 4.4.1.2 and Table 4.4.1.3), high significance levels of sector dummy coefficients indicate that there are some sector specific fixed effects beyond the sector specific control

variables included in the regressions. Although it is not reported, the correlation between the real growth of the overall economy and the real growth rate of the sectoral GDPs seem to be correlated (correlation is above 0.6). For this reason, I also run regressions III and IV with real growth rate of the GDP of the overall economy alone (eliminating the sectoral growth rate variable and the results suggest that GDP growth rate of the economy is also negative and significant at 5 significance). This result supports the expectations and result suggests that an increase in the real GDP growth decreases the probability of informal employment. This result complies with our argument that when the economy is operating well, firms tend to employ people more formally (probably they hire more formal workers or they employ existing informal workers as formal). The coefficient of real effective exchange rate has a positive sign but it is not significant.

CHAPTER V

CONCLUSION

This thesis examines two things: the formal and informal employment probabilities and determinants of the differences of probabilities of informal employment across the sectors. The thesis suggests that there are significant differences among sectors in terms of probabilities of informal employment. While agriculture and construction sectors are found to be the most informal sectors, mining and financial sectors are the most formal ones. Additionally, after controlling for business cycle and sector specific effects, male worker share, bank credit volume to sectors and sectoral real growth rates are found to be significant determinants of the probability differences of the sectors in terms of formal and informal employment. The results suggest that higher shares of working men, higher bank credits over sectoral GDP ratio and higher real GDP growth of the sector increase the tendency of formal employment.

Utilizing the LFHS data for the period 2000-2008, I used the social security registration information as an indicator for informality in the economy. Applying the two stage methodology of Pavcnik and Goldberg (2003), I decompose the worker's characteristics and working sector properties of probability of informal employment. The first stage regressions suggest that male

workers are more likely to be employed formally compared to female workers. The possibility of married people to be employed formally is higher than the single ones as well. Moreover, people who work in urban areas, probably due to the variety of job opportunities, are more likely to be employed formally compared to people who work in rural areas. Education also increases the probability of formal employment; people with more education are less likely to be employed informally compared to those who have less education. Lastly, younger people are more likely to be employed informally compared to elder people. According the findings from the regressions in the first stage, the policies to increase the education and skill level of the people are appropriate to decrease the level of informally working people in each sector.

In the first stage, the coefficients of the sector dummies (informality differentials) are used properly to create an average measure of the total informality in Turkey. Sectoral differences, which are called normalized informality differentials, are evaluated based on the difference from the average sector. This discussion allows me to identify the decreasing trend of the probability of informal employment by looking at the average sector over the period 2000-2008.

In the second stage, I pool the normalized informality differentials across time and regress these differentials on many variables which may have explanatory power on the differences of probability of informal employment of the sectors. Applying feasible generalized least square method on the panel data and after controlling for business cycle and sector specific effects, I find that the share of the male workers and credit availability to the sector (over the sector's

GDP) have significant explanatory powers in explaining the differences in the probability of informal employment across sectors.

The results of the thesis are important in two ways: first, this thesis suggests that differences in informal employment probabilities of the sectors are obvious and these differences do not only stem from the worker's characteristics. This finding is crucial for policy implications since the results suggest that policies, which concentrate only on the human capital and education of the people, will not solve the informality problem totally in the whole economy. Although my regression analysis are based on the sectoral differences, the regression results suggest that as one sector has more chance to get credits, the probability of formal employment level of the sector is likely to increase. In this manner, one of the sector-based issues of the solution to prevent sectoral based informality is to increase the credit opportunities to firms.

Policies, which help to increase the availability of credits to people as well as firms, are also likely to stimulate the formal job opportunities in the economy. Those operating in the informal economy have limited access to finance and, as a consequence, fewer opportunities to expand their business or respond to opportunities, or improve productivity. Lack of collateral can freeze many informal operators out of formal credit institutions[65]. From this point of view, it is important to mention about the appropriateness of the microcredit policies in Turkey. Increasing the micro credits, which is regarded as an instrument for to enhance the income in the socio-economically depressed areas by providing financial support to the micro and small enterprises[66] may be one of the workable

[65] See the report on Informal Economy by International Organization of Employers in 2006.
[66] See Karataş and Helvacığlu (2008).

solutions, at least to some degree, to increase the number of formal works in the economy.

I think that there are many other issues that should be taken into consideration while approaching the sectoral differences in the informal employment among sectors. For example, if there are loose tendencies of the legal authorities to specific sectors in terms of the punishment system, it is highly likely that firms operating in that sector will employ people more informally. Additionally, the power of lobbies related to specific sectors can be one of the main reasons of the differences of the informal employment tendencies among sectors. The above analysis should be further enriched to capture taxes, measures of costs of incompliance with regulation and several other sector specific measures, which remains an agenda for future research.

SELECT BIBLIOGRAPHY

Akalın, Gülsüm and Ferdi Kesikoğlu. 2007."Informal Economy in Turkey and Growth," *ZKÜ Sosyal Bilimler Dergisi* 3(5):71-87.

Aleman-Castilla, Benjamin. 2006. "The Effect of Trade Liberalization on Informality and Wages: Evidence from Mexico," CEP Discussion Paper No.763.

Assaad, R. 1987. "Explaining Informality: The Determinants of Compliance with Labor Market Regulations in Egypt," Paper presented at the Economic Research Forum, Fourth Annual Conference in Beirut, Lebanon, September 7-9. In Tansel, Ayşit. 2000. "Wage Earners, Self-Employment and Gender in the Informal Sector in Turkey," World Bank Research Group, Working Paper Series No. 24.

Attanasio, Orazio, Pinelopi K. Goldberg and Nina Pavcnik. 2004. "Trade Reforms and Wage Inequality in Colombia" *Journal of Development Economics* 74(2):331-366.

Azuma, Yoshiaki and Herschel I. Grossman. 2002. "A Theory of the Informal Sector," NBER Working Paper Series No.8823.

Beck, Nathaniel and Jonathan Katz. 1995. "What to Do (and Not to Do) with Time-Series-Cross-Section Data," *American Political Science Review* 89(3):634–647.

Biorn, Erik. 2010. "Disturbance Serial Correlation and Disturbance Heteroskedasticity in Panel Data Models," Department of Economics Lecture Notes No.5, University of Oslo.

Blau, M. David. 1987. "A Time Series Analysis of Self-Employment in the United States. *Journal of Political Economy* 95(3):445-67.

Breusch, Trevor. 2005. "Estimating the Underground Economy Using MIMIC Models," Working Paper, School of Economics, Faculty of Economics and Commerce, The Australian National University.

Bulutay, Tuncer and Enver Taştı. 2004. "Informal Sector in the Turkish Labor Market," TEK discussion Papers No.2004/22.

Catao, L., C. Pages and M. F. Rosales. 2009. "Financial Dependence, Formal Credit and Informal Jobs - New Evidence from Brazilian Household Data," RES Working Papers No.4642.

Currie Janet and Ann Harrison. 1997. "Sharing the Costs: The Impact of Trade Reform on Capital and Labor in Morocco," *Journal of Labor Economics* 15(3): 44-71.

Çetintaş, Hakan and Hasan Vergil. 2003. "Estimation of Underground Economy in Turkey," *Doğuş Üniversitesi Dergis*i 4(1):15-30.

Dabla-Norris, Era, Mark Gradstein and Gabriela Inchauste. 2008. "What Causes Firms to Hide Output? The Determinants of Informality," *Journal of Development Economics* 85(1-2):1-27.

Debertin, David L., Angelos Pagoulatos and Eldon Smith. 1980. "Estimating Linear Probability Functions: A Comparison of Approaches," *Southern Journal of Agricultural Economics* 12(2):65-69.

Feige, Edgar L., 1990. "Defining and estimating underground and informal economies: The New Institutional Economics Approach," *World Development,* 18(7):989-1002.

Friedman, Eric, S. Johnson, D. Kaufmann, P. Zoido-Lobaton. 2000. "Dodging the Grabbing Hand: The Determinants of Unofficial Activity in 69 Countries," *Journal of Public Economics* 76(3):459-493.

Garcia-Verdu, Rodrigo. 2007. "The Informal Sector: What Is It, Why Do We Care, and How Do We Measure It?," Photocopy, The World Bank. In Perry, G. E., W. F. Maloney, O. S. Arias, P. Fajnzylber, A. D. Mason, J. S. Chanduvi. 2007, "Informality: Exit and Exclusion", *The World Bank Latin American and Caribbean Studies*, 21:40.

Ghosh, A. and Paul Saumik. 2008. "Opening the Pandora's Box? Trade Openness and Informal Sector Growth," *Applied Economics* 40(15):1991-2003.

Haisken-DeNew, John P. and Christoph M. Schmidt. 1997. "Interindustry and Interregion Differentials: Mechanics and Interpretation," *The Review of Economics and Statistics* 79(3): 516-521.

Henley, Andrew, G. Reza Arabsheibani and Francisco G. Carneiro. 2009. "On Defining and Measuring the Informal Sector." *World Development* 37(5):992-1003.

Ihrig, Jane and Karine S. Moe. 2000. "The Dynamics of Informal Employment," International Finance Discussion Papers No.664.

International Organization of Employers. 2006. "The Informal Economy: The Employer's Approach,".

Jha, Raghbendra. 2003. “Macroeconomics for Developing Countries” Bell & Bain Ltd Company, Glasgow.

Jütting, Johannes, Jante Parlevliet and Theodora Xenogiani. 2008. “Informal Employment Re-loaded,” OECD Development Working Paper No.266.

Karataş, Abdülmecit and Asli Deniz Helvacioglu. 2008. “The Microcredit Strategies for SMEs in Turkey in the EU Harmonization Process,” 8th Global Conference on Business & Economics, Boğaziçi University Scientific Research Projects No.07N201.

Kaufmann, Daniel and A. Kaliberda, 1996. "Integrating the Unofficial Economy into the Dynamics of Post-Socialist Economies: A Framework of Analysis and Evidence,” Policy Research Working Paper Series No.1691.

Khachatryn A., M. von Oppen, R. Doluchitz and N. Khachatryn. 2005. “Response of Plant Productivity to Improved Agricultural Markets in India : An Advanced Application of Econometric Cross-Section Time Series Analysis” Department for Computer Applications and Business Management in Agriculture and Former Department of Agricultural Marketing, University of Hohenheim, Stuttgart, Germany.

Koeda Junko and Era Dabla Norris. 2002. “Informality and Bank Credit: Evidence from Firm Level Data,” IMF Working Paper No. 08/94.

Krueger, Alan B. and Lawrence H. Summers. 1988. “Efficiency Wages and the Inter-Industry Wage Structure” *Econometrica* 56(2):259-293.

Li, Jing. 2006. “The Block Bootstrap Test of Hausman's Exogeneity in the Presence of Serial Correlation,” *Economic Letters* 91(2):76-82.

Loayza, W. Norman. 1997. "The Economics of the Informal Sector: A Simple Model and Some Empirical Evidence from Latin America," World Bank Policy Research Working Paper Series No.1717.

Loayza, Norman, Ana M. Oviedo and Luis Serven. 2005. “The Impact of Regulation on Growth and Informality Cross-Country Evidence,” World Bank Policy Research Working Paper Series No.3623.

Macias, Jose Brambila. 2008. “Modeling the Informal Economy in Mexico. A Structural Equation Approach,” MPRA Paper No.8504.

Maloney, F. William. 1999. “Does Informality Imply Segmentation in Urban Labor Markets? Evidence from Sectoral Transitions in Mexico,” *World Bank Economic Review* 13(2):275-302.

_____. 2004. “Informality Revisited,” *World Development* 32(7):1159-1178.

Özlale, Ümit. 2008 "Dynamics of Informal Economy in Turkey," *Bütçe Dünyası* 3(30):1-11.

Pavcnik, Nina and Pinelopi K. Goldberg. 2003. "The Response of the Informal Sector to Trade Liberalization," *Journal of Development Economics* 72(2):463-496.

Portes, A. 1994. "The Informal Economy and its Paradoxes," in N. Smelser and R. Swedberg, eds. *The Handbook of Economic Sociology*. Princeton: Princeton University Press.

Perotti, Valeria and Maria L. S. Puerta. (2009). "Personal Opinions about the Social Security System and Informal Employment: Evidence from Bulgaria," Social Protection and Labor Discussion Paper No.0915.

Perry, G. E., W. F. Maloney, O. S. Arias, P. Fajnzylber, A. D. Mason, J. S. Chanduvi. 2007, "Informality: Exit and Exclusion", *The World Bank Latin American and Caribbean Studies*, 21:40.

Saraçoğlu, D. Şirin. 2008. "The Informal Sector and Tax on Employment: A Dynamic General Equilibrium Investigation," *Journal of Economic Dynamics and Control* 32(2):529-549.

Sarte, Pierre-Daniel. 2001. "Rent-Seeking Bureaucracies and Oversight in a Simple Growth Model," *Journal of Economic Dynamics and Control* 25(2001):1345-1365.

Savaşan, Fatih. 2003. "Modeling the Underground Economy in Turkey: Randomized Response and MIMIC Models", *Journal of Economics* 29(1):49-76.

Schneider, F. 1986. "Estimating the Size of the Danish Shadow Economy Using the Currency Demand Approach: An Attempt," *Scandinavian Journal of Economics*: 88(4):643-668.

_____. 2005. "Shadow Economies Around the World: What Do We Really Know?," *European Journal of Political Economy* 21(3):598-642.

Schneider, Friedrich and Dominik H. Enste. 2000. "Shadow Economies: Size, Causes and Consequences," *Journal of Economic Literature* 38(1):77-114.

Schneider, Friedrich and Fatih Savaşan. 2006. "What Determines Informal Hiring? Evidence from Turkish Textile Sector, "Department of Economics of Johannes Kepler University Working Paper No.0604.

_____. 2007. "Dymimic Estimates of the Size of Shadow Economies of Turkey and of Her Neighboring Countries," *International Research Journal on Finance and Economics* (9):126-143.

State Planning Organization. 2001. *The 8th Five Year Development Plan: Special Commission Report on Informality,* Ankara.

Stock, J.H. and M.W. Watson(2003). Introduction to Econometrics. Pearson Education, 2004, Delhi, India. In Khachatryn A., M. von Oppen, R. Doluchitz and N. Khachatryn. 2005. "Response of Plant Productivity to Improved Agricultural Markets in India: An Advanced Application of Econometric Cross-Section Time Series Analysis" Department for Computer Applications and Business Management in Agriculture and Former Department of Agricultural Marketing, University of Hohenheim, Stuttgart, Germany.

Straub, Stephane. 2005. "Informal sector: The Credit Market Channel," *Journal of Development Economics* 78(2):299-321.

Tansel, Ayşit, 1999. "Formal versus Informal Sector Choice of Wage Earners and Their Wages in Turkey," Economic Research Forum Working Paper No. 9927.

Tedds, M. Lindsay and David E. A. Giles. 2000. "Modeling the Underground Economies in Canada and New Zealand: A Comparative Analysis," Econometrics Working Paper Series No.EWPS0003.

Temel, Adil, Ayşegül Şimşek and Kuddusi Yazıcı. 1994. "Definiton of Infomal Economy, Its Measurement Methods and Its Measurement in Turkey," State Planning Organization, Ankara.

Thomas, Jim. 1999. "Quantifying the Black Economy: 'Measurement without Theory' Yet Again?," *The Economic Journal* 109(456):381-389.

Turkish Statistical Institute, 2007. "Labor Force, Employment and Unemployment Statistics," Turkish Statistical Institute Press, Ankara.

Us, Vuslat. 2005. "Suggestion for Estimating Informal Economy: Turkish Case," TEK Discussion Papers No. 2004/17.

Uzunoğlu, Hande.2005. "New Regulations in Mining Sector," R&D Bulletin of Izmir Chamber of Commerce, Izmir.

Yılmaz, Gökhan and Fethi Öğünç. 2000. "Estimating the Underground Economy in Turkey," Discussion Paper Series of Research Department of the Central Bank of the Turkish Republic.

Yurdakul, Funda. 2006. "Informal Economy in Turkey: A Model Attempt," *Ankara Üniversitesi SBF Dergisi* 63(4):206-221.

Zanchi, Luisa. 1998. "Interindustry Wage Differentials in Dummy Variable Models," *Economic Letters* 60(3):297-301.